SAMSUNG DISPLAY

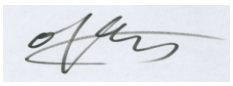
PRODUCT SPECIFICATION

(√) PRODUCT INFORMATION
( ) APPROVAL SPECIFICATION

This Product Information is subject to change after 3 months of issuing date

CUSTOMER	Lenovo	**MODEL**	LTM270DL07
PROGRAM	Aventador / A740	**EXTENSION CODE**	M01

CUSTOMER APPROVAL & FEEDBACK

ARPPROVED BY	2 / Aug. / '13	Nicolas Lee	
PREPARED BY	2 / Aug. / '13	Kevin Park	

Application Engineering Group

Samsung Display Co., Ltd.

Contents

Revision History

Version	Date	Page	Description
P0.0	2. Aug., 2013	All	Product information

1. General Description

Overview

LTM270DL07 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 27.0" is 2560 x 1440 (QHD) and this model can display up to 16.7 million colors.

Features

Application - Workstation & Desktop monitors - Display terminals for AV Products - Monitors for Industrial machine
DE (Data Enable) only mode
LVDS (Low Voltage Differential Signaling) interface (4pixel/clock)
RoHS, Halogen Free
LED back light with an embedded LED driver (2-side)
Onboard EDID chip

General Information

Items	Specification	Unit
Pixel Pitch	0.233(H) x 0.233(W)	mm
Active Display Area	596.74(H) x 335.66(V)	mm
Surface Treatment	Glare type, Haze 1%	-
Display Colors	16.7M (True 8bit)	colors
Number of Pixels	2,560 x 1,440	pixel
Pixel Arrangement	RGB vertical stripe	-
Display Mode	Normally Black (PLS mode)	-
Luminance of White	300 (Typ.)	cd/㎡
Power Consumption	Total 21.0W (Typ. TBD) (Panel 5.0W / BLU 16.0W)	W

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	-	626.3	-	mm	w/o flange
	Vertical (V)	-	362.6	-	mm	with shield case
	Depth (D)	-	5.4	-	mm	-
Weight		-	-	(TBD)	g	LCD module only

Note (1) Mechanical tolerance is ± 0.5mm unless there is a special comment.

2. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	GND-0.5	5.5	V	(1)
Operating Temperature	T_{OPR}	0	50	℃	(2)
Storage temperature	T_{STG}	-20	60	℃	
Glass surface temperature (Operation)	T_{SUF}	0	65	℃	(3)

Note (1) Ta= 25 ± 2 °C

(2) Temperature and relative humidity range are shown in the figure below.
a. 90 % RH Max. (Ta ≤ 39 °C)
b. Maximum wet-bulb temperature at 39 °C or less. (Ta ≤ 39 °C)
c. No condensation.

(3) The maximum operating temperature of LCD module is defined with surface temperature of active area. Under any conditions, the maximum ambient operating temperature should be keeping the surface of active area not higher than 65 °C

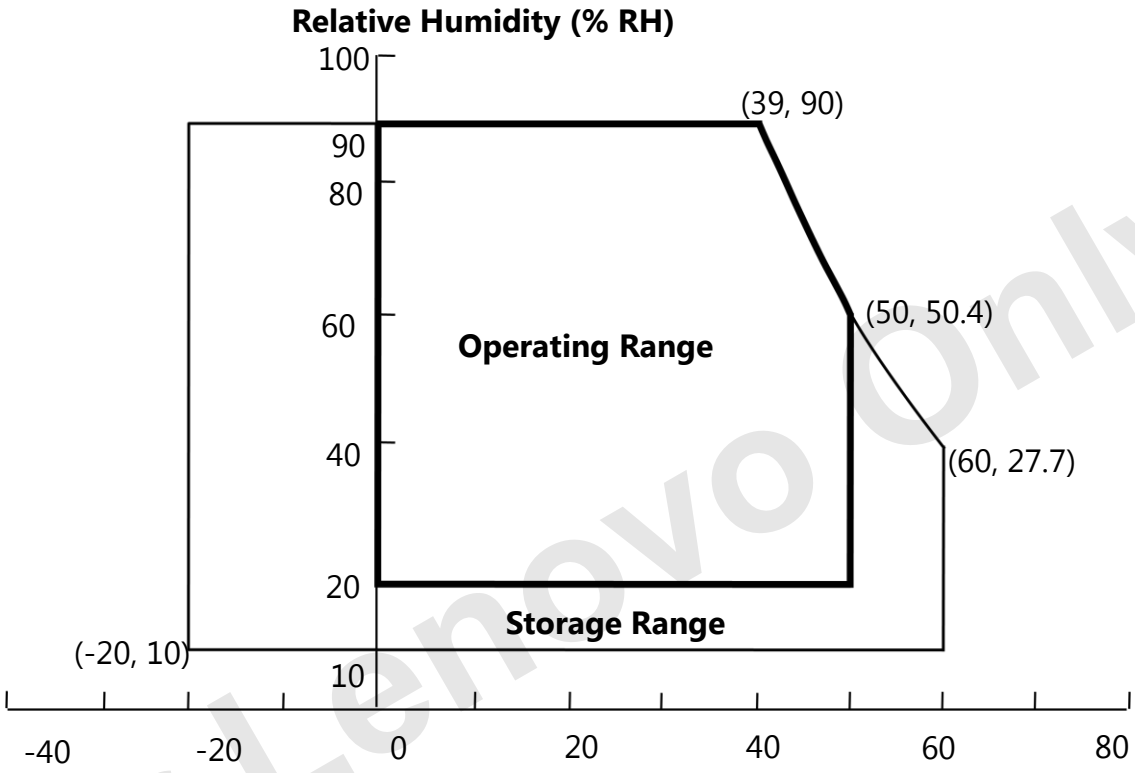


Fig. Temperature and Relative Humidity range

3. Optical Characteristics

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : SR-3, RD-80S (TOPCON), EZ-Contrast (Eldim)

(Ta = 25 ± 2°C, VDD=5V, fv= 60Hz, f_{DCLK}=60.38MHz, (If =384mA))

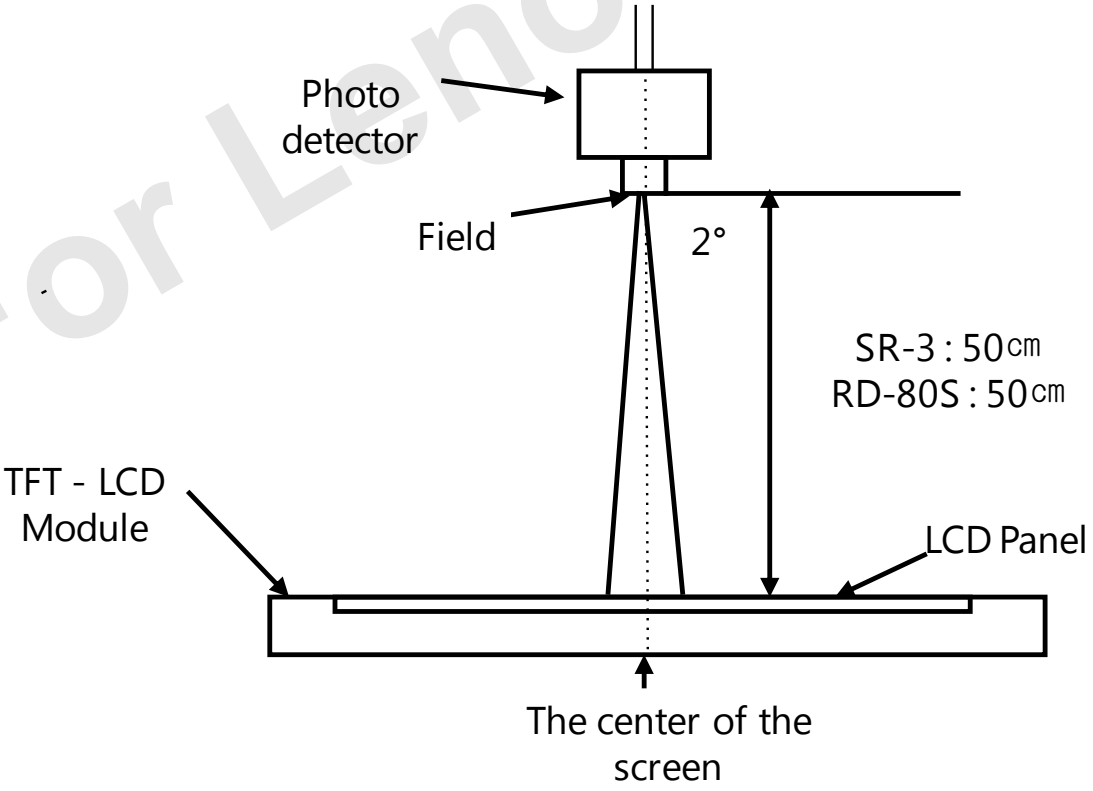
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		600	1000	-		(3) SR-3
Response Time		G to G		-	15	(25)	msec	(5) RD-80S
Luminance of White (Center of screen)		Y_L		(250)	300	-	cd/m^2	(6) SR-3
Brightness Uniformity (9 Points)		B_{uni}		-	-	25	%	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx	Normal $\theta_{L,R}$=0 $\theta_{U,D}$=0 Viewing Angle	- 0.030	(0.647)	+0.030		(7),(8) SR-3
		Ry			(0.341)			
	Green	Gx			(0.328)			
		Gy			(0.610)			
	Blue	Bx			(0.148)			
		By			(0.068)			
	White	Wx			0.310			
		Wy			0.340			
Color Chromaticity (CIE 1976)	Red	Ru'		-	(0.446)	-		
		Rv'		-	(0.529)	-		
	Green	Gu'		-	(0.136)	-		
		Gv'		-	(0.568)	-		
	Blue	Bu'		-	(0.168)	-		
		Bv'		-	(0.174)	-		
	White	Wu'		-	0.192	-		
		Wv'		-	0.474	-		

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Gamut		-		-	(72)	-	%	
Color Temperature		-		-	(6500)	-	K	
Viewing Angle	Hor.	θ_L	CR≥10	80	89	-	Degrees	(8) EZ-Contrast
		θ_R		80	89	-		
	Ver.	θ_U		80	89	-		
		θ_D		80	89	-		

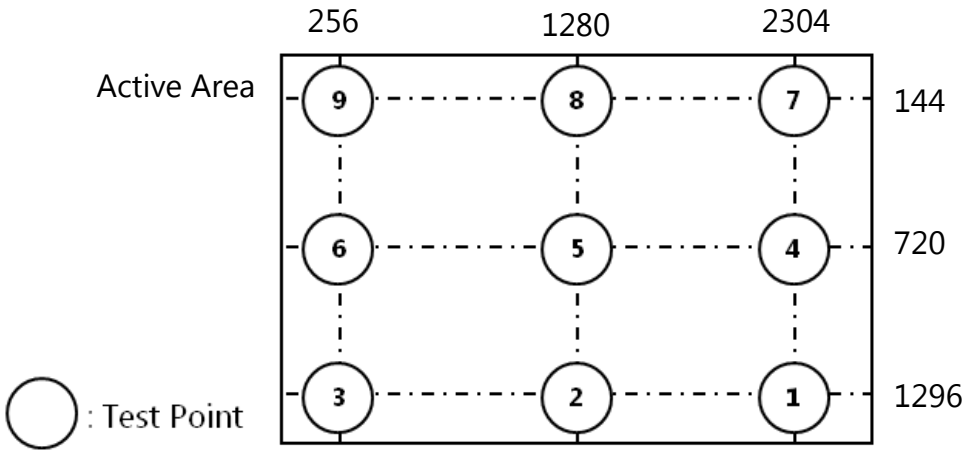
Note (1) Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 30min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of the screen.

LED forward current : If = (384mA) Environment condition : Ta = 25 ± 2 °C



(2) Definition of test point



(3) Definition of Contrast Ratio (CR)

: Ratio of gray max (G_{max}) & gray min (G_{min}) at the center point⑤ of the panel

$$CR = \frac{G_{max}}{G_{min}}$$

G_{max} : Luminance with all white pixels
G_{min} : Luminance with all black pixels

(4) Definition of 9 points brightness uniformity

$$B_{uni} = 100 \times \frac{B_{max} - B_{min}}{B_{max}}$$

B_{max} : Maximum brightness
B_{min} : Minimum brightness

(5) Definition of Response time

GtoG : The time of transitions between specific gray levels

- 31 → 63, 63 → 95, 95 → 127, 127 → 159, 159 → 191 , 191 → 223 grays and vice versa
- G to G typ. : Average time of rising and falling for gray transition except the transition

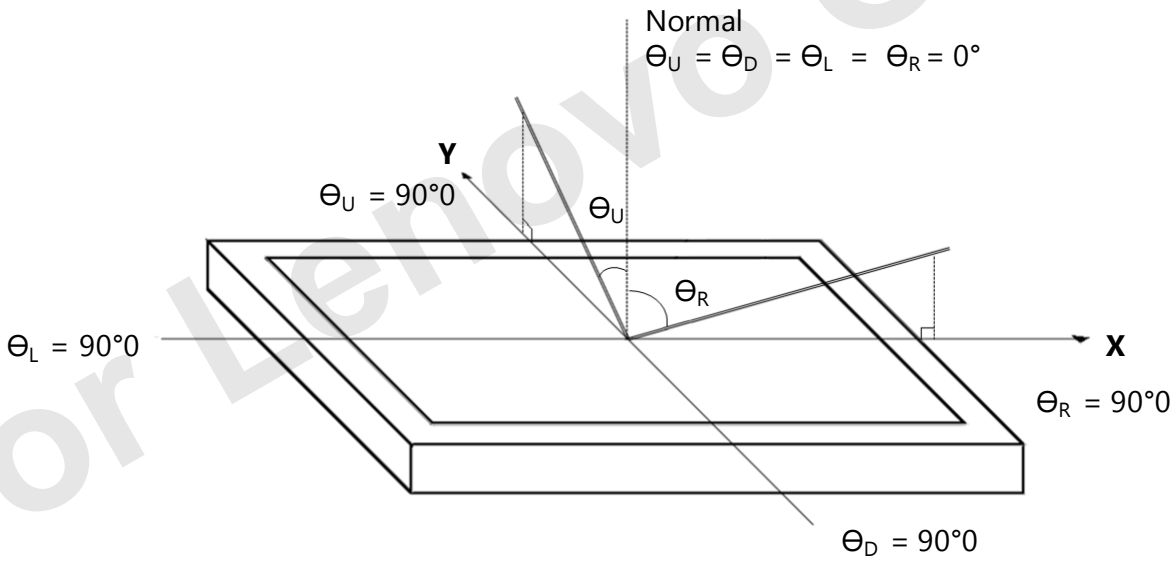
(6) Definition of Luminance of White : Luminance of white at center point ⑤

(7) Definition of Color Chromaticity (CIE 1931, CIE1976)

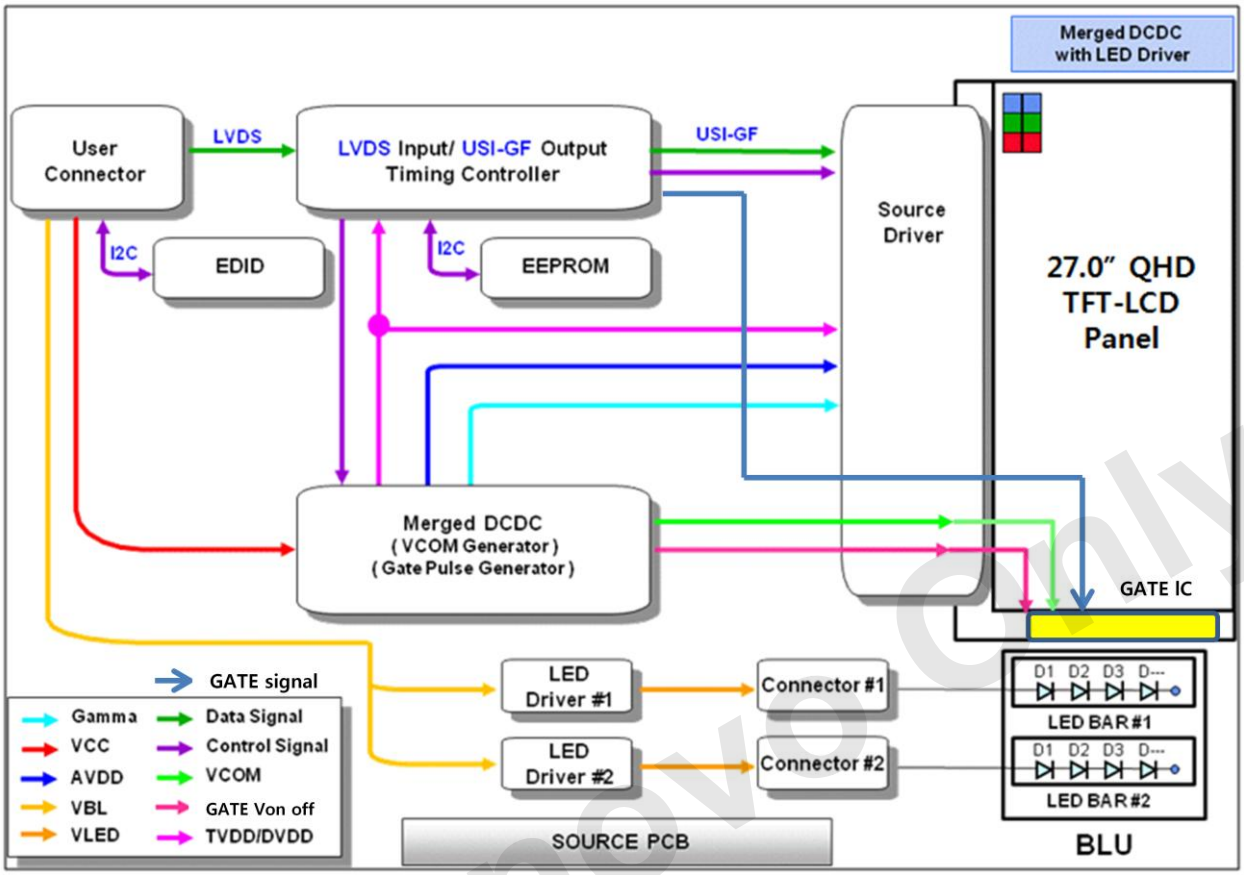
Color coordinate of Red, Green, Blue & White at center point ⑤

(8) Definition of Viewing Angle

: Viewing angle range (CR ≥ 10)



4. Block Diagram



5. Electrical Characteristics

5.1 TFT LCD Module

The connector of display data & timing signal should be connected.

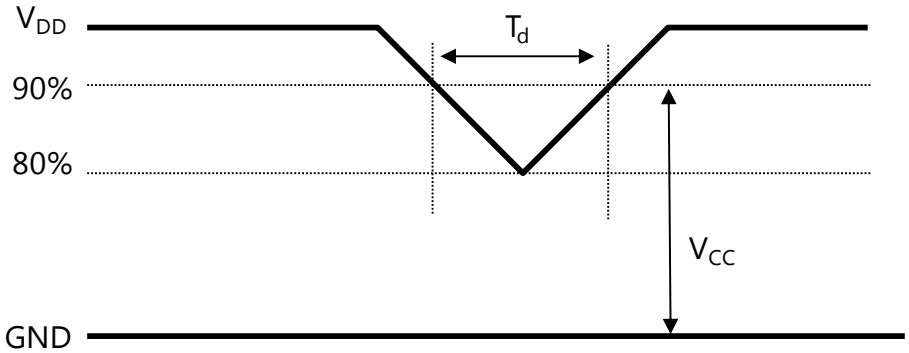
Ta=25 ± 2°C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	4.5	5.0	5.5	V	(1)
Power Dip Condition		V_{CC}	4.0	-	V_{DD}	V	(2)
		T_d	0	-	20	msec	
Current of Power Supply	(a) White	I_{DD}	-	(1000)	-	mA	(3),(4)
	(b) Black		-	(TBD)	-	mA	
	(c) Dot		-	(TBD)	-	mA	
Power Consumption		P_{LCD}	-	(5.0)	-	Watt	(4),(5)
Rush Current		I_{RUSH}	-	-	5.0	A	(6)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}

(2) Definition of V_{DD} Power Dip

- The above conditions are for the glitch of the input voltage.
- For stable operation of an LCD Module power, please follow them.



$4.5V \le V_{DD} \le 5.5V$

If V_{DD}(Typ.) x 80% $\le V_{CC} \le$ V_{DD}(Typ.) x 90%,
then 0<Td ≤20msec

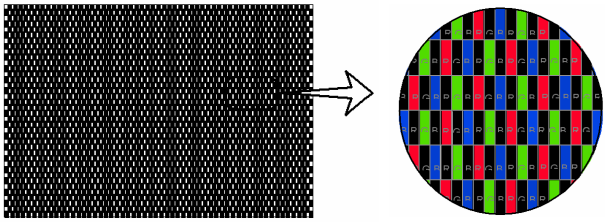
(3) f_V=60Hz, f_{DCLK} = 60.38MHz, V_{DD} = 5.0V, DC Current.

(4) Power dissipation check pattern (LCD Module only)

a) White Pattern

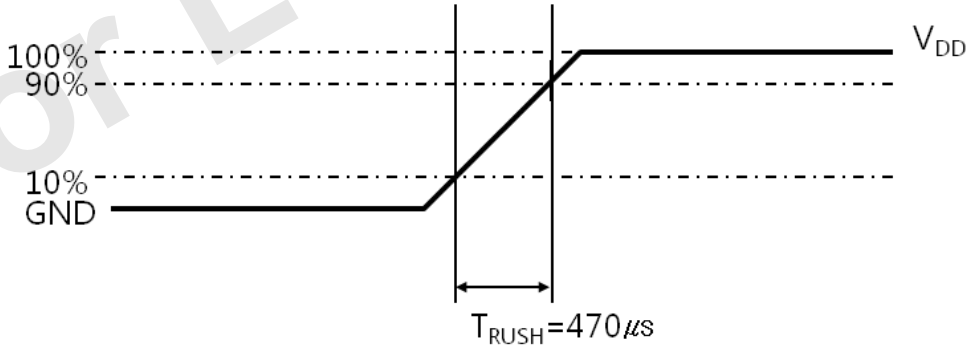
b) Black Pattern

c) Dot Pattern



(5) The power consumption is specified whereas Dot pattern is displayed at f_V=60Hz, f_{DCLK} = 60.38MHz, V_{DD} = 5.0V

(6) Measurement Condition



Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470㎲

5.2 Backlight Unit

The characteristics of LED bar Ta=25 ± 2°C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	I_F	-	(384)	-	mA	(1),(2)
LED Array Voltage	V_P	-	(40.6)	-	V	(1)
Power Consumption	P_{BLU}		(15.6)		Watt	(3)
Operating Life Time	Hr	(15,000)	-	-	Hour	(4)

Note (1) The specification shown above are not for the converter output, but for the LED bar.
- The LED bar consists of 224 LED packages ; 16 parallel X 14 serial
- LED current is defined at 100% duty ratio of LED driver

(2) The LED Forward current for single LED channel is Typ. (24mA)
- The output current of converter in the system should be transmitted to the LED bar constantly.
- It is recommended to control the returned signal respectively for even distribution of current to each channel of LED bar

(3) The power consumption is specified at typical current TBD with 100% duty ratio
- It does not include power loss of external LED driver circuit block
- Typical power consumption $P_{BLU} = I_F$ (Typ.) x V_P (Typ.)

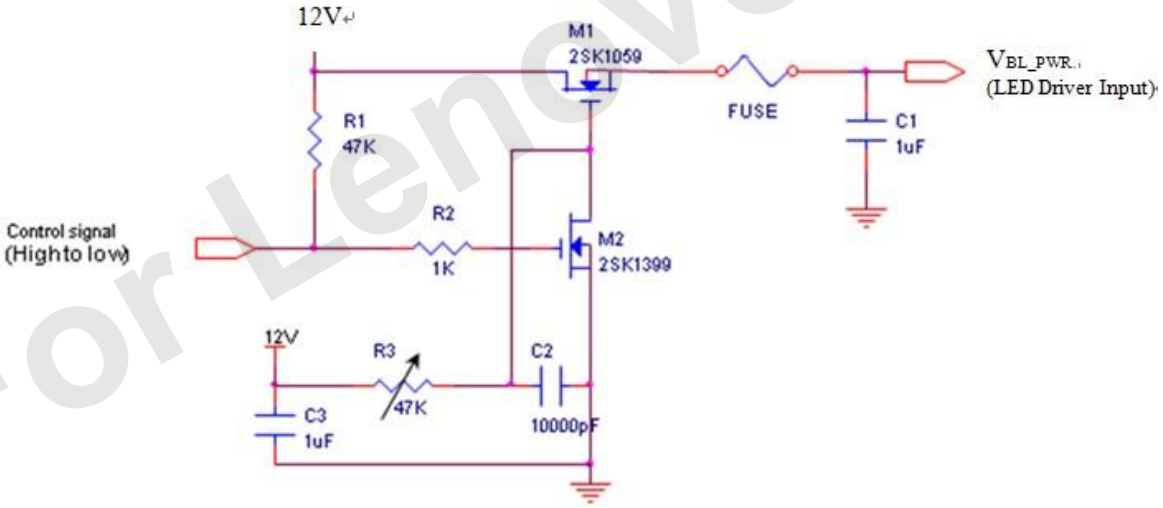
(4) Life time(Hr) is defined as the time when brightness of a LED package itself becomes 50% or less than its original value at the condition of Ta=25 ± 2°C and I_F =(384mA.)

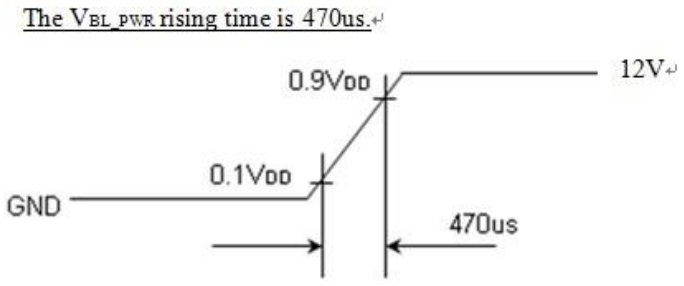
5.3 LED Driver

The manufacturer of LED driver : (Richtek RT8561) Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{BL_PWR}	(TBD)	12	(TBD)	V	
Input Current	I_{BL_PWR}	-	(TBD)	(TBD)	mA	Vin=12V Duty 100%
PWM duty Ratio	$D_{BL\_PWM\_DIM}$	1	-	(TBD)	%	PWM : 200Hz~1kHz PWM : 1kHz~10kHz PWM : 10kHz~20kHz *PWMI min duty 1% @ DPST_EN*
		(TBD)		(TBD)		
		(TBD)		(TBD)		
External PWM Frequency	$F_{BL\_PWM\_DIM}$	(TBD)	(TBD)	(TBD)	kHz	
In-Rush Current	$I_{RUSH\_BL\_PWR}$	-	-	(TBD)	A	(1)

Note (1) Rush current measurement condition





5.4 LVDS Characteristics

5.4.1. LVDS Input Characteristics

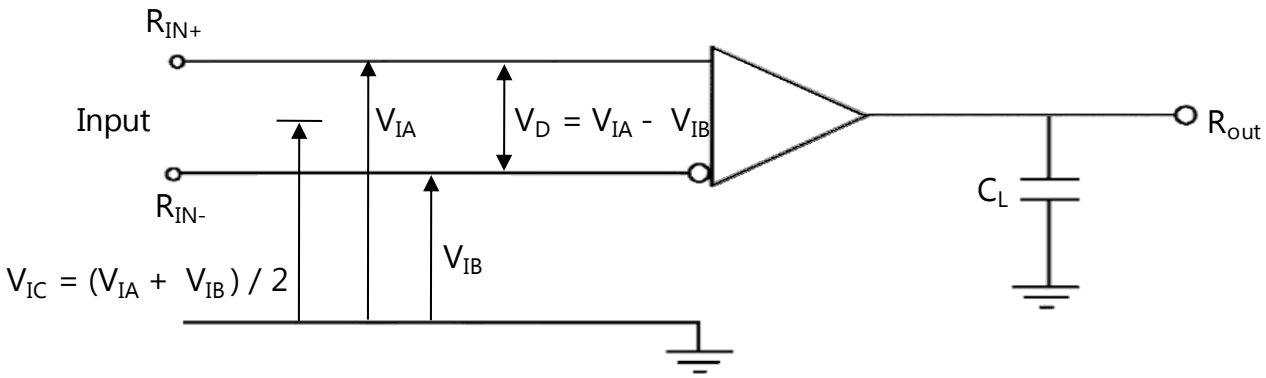
Ta=25 ± 2°C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Differential Input Voltage for LVDS receiver threshold	High	-	-	+100	mV	(1)
	Low	-100	-	-	mV	
LVDS skew	t_{SKEW}	-300	-	300	ps	(2)
Differential input voltage	$\|V_{id}\|$	100	-	600	mV	(3)
Input voltage range(single ended)	V_{in}	0.7	-	1.7	V	(3)
Common mode voltage	V_{cm}	1.0	1.2	1.4	V	(3)

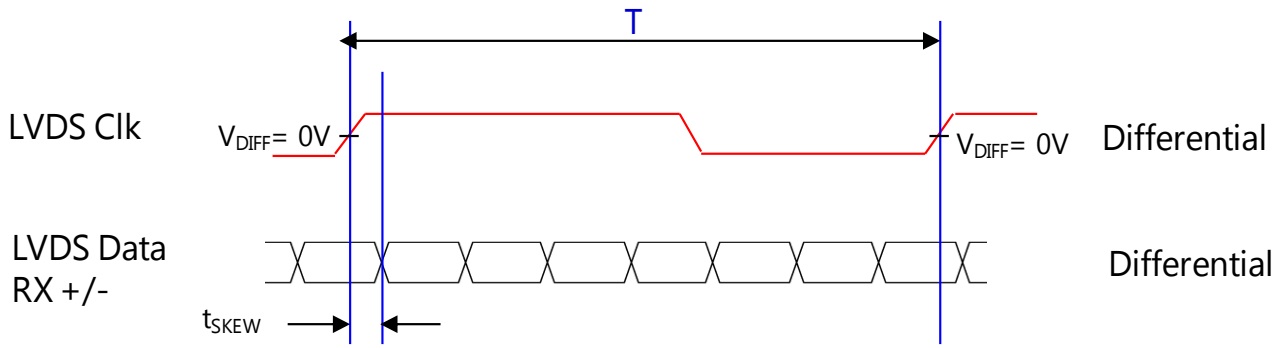
Note (1) Differential receiver voltage definitions and propagation delay and transition time test circuit

a. All input pulses have frequency of 10MHz, t_R or t_F =1ns

b. C_L includes all probe and fixture capacitance

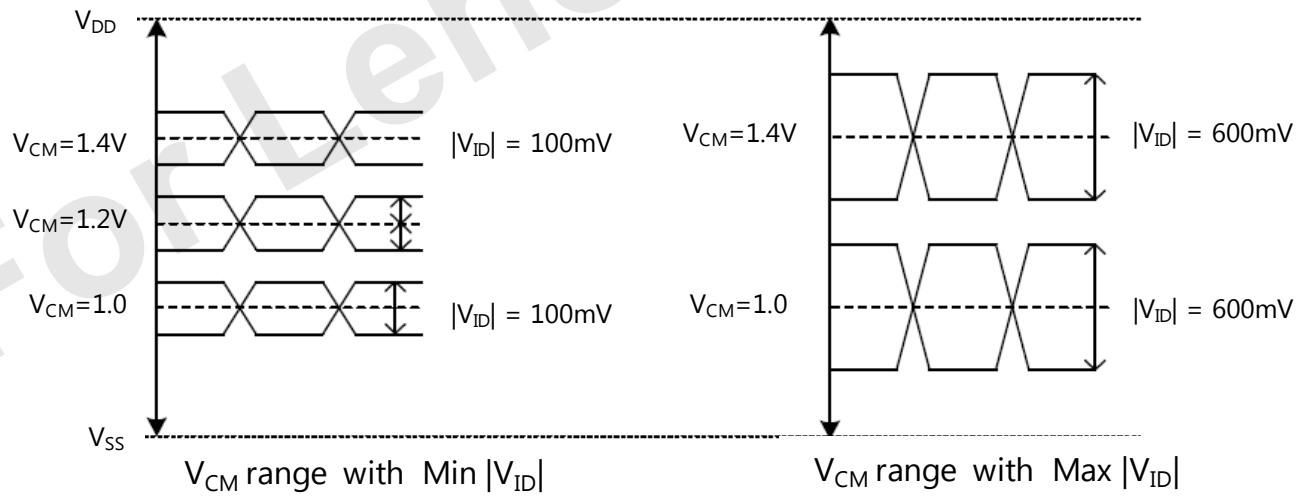


(2) LVDS Receiver DC parameters are measured under static and steady conditions which may not be reflective of its performance in the end application.



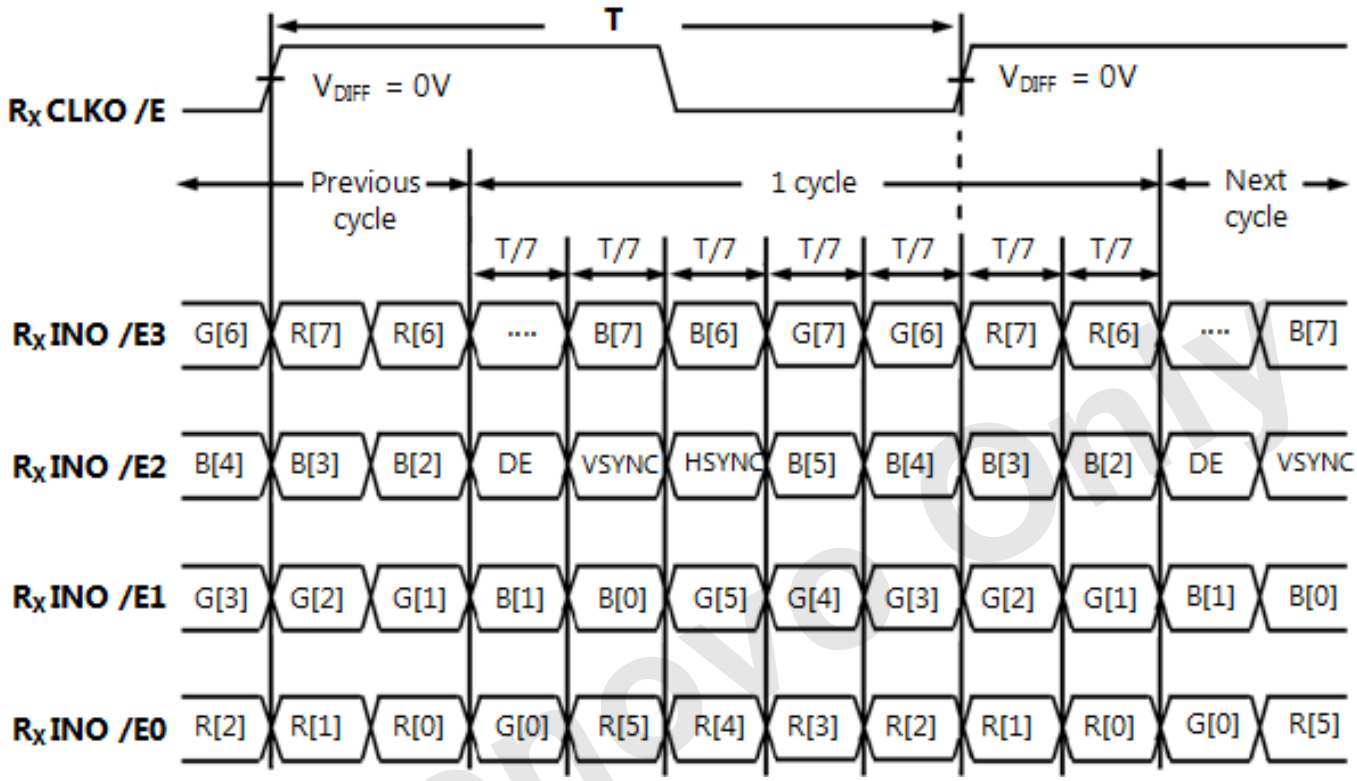
where t_{SKEW} : skew between LVDS clock & LVDS data,
T : 1 period time of LVDS clock
cf. (-/+) of 300psec means LVDS data goes before or after LVDS clock

(3) Definition of V_{ID} and V_{CM} using single-end signals



5.4.2. LVDS Data Format

Timing Diagrams of LVDS For Transmitting
- LVDS Receiver : Integrated T-CON



5.5 Interface Timing Specification

5.5.1. Timing Parameters

SIGNAL	ITEM	SYMBOL	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	$1/T_C$	55.25	60.38	65.63	MHz	-
Hsync		F_H	81.25	88.79	96.51	kHz	-
Vsync		F_V	55	60	65	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	1440	1440	1440	Lines	-
	Vertical Total	T_V	1478	1481	1485	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	640	640	640	Clocks	4pixel/clock
	Horizontal Total	T_H	680	680	680	clocks	4pixel/clock

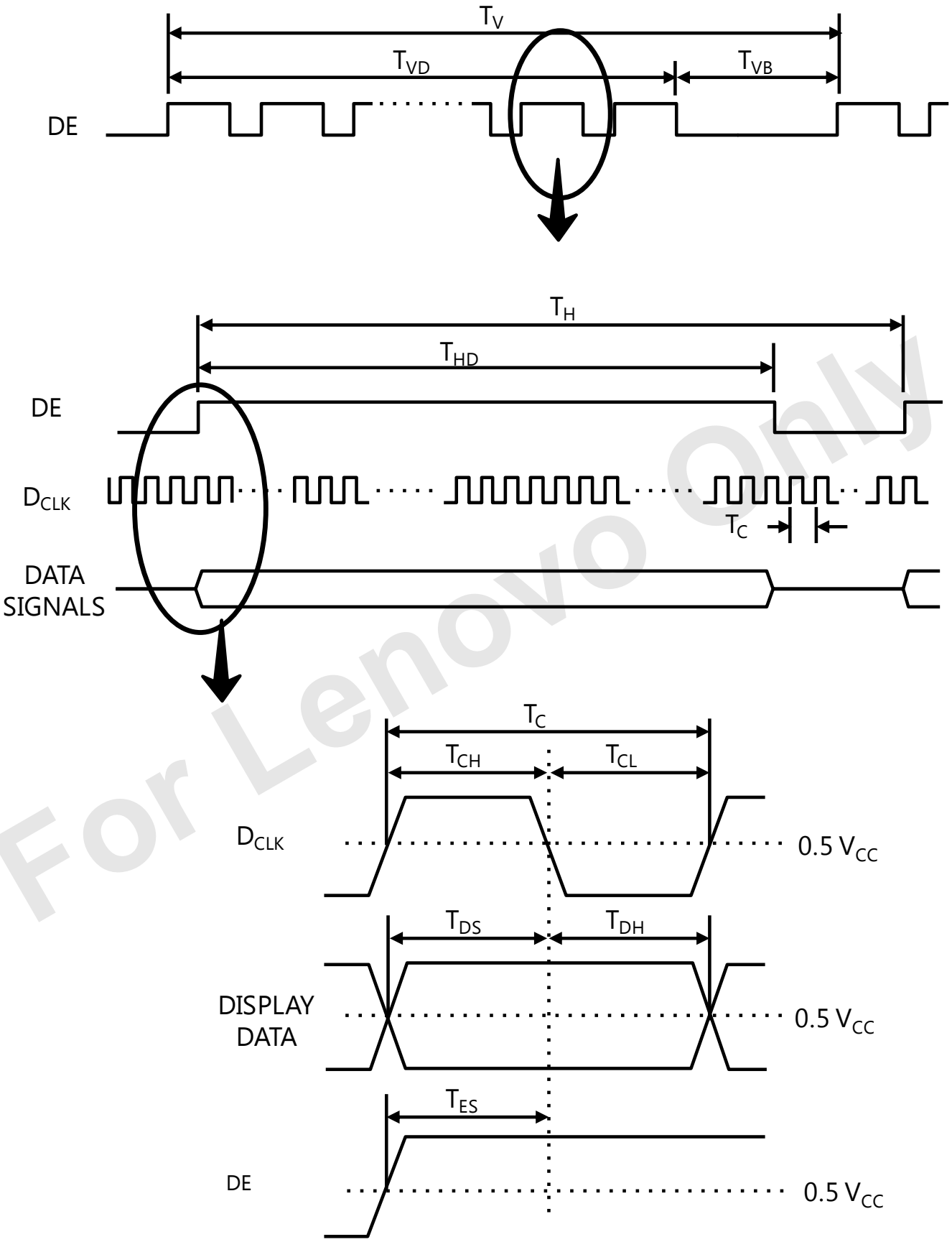
Note (1) DE only mode
- While operation, DE signal should be have the same cycle.

(2) Best operation clock frequency is 60.38MHz(60Hz)

(3) Max, Min variation range is at main clock typical value (60.38MHz)

(4) Main frequency Max is 65.63MHz without spread spectrum

5.5.2. Timing diagrams of interface signal (DE only mode)



5.6 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			. . .
	↓ LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			. . .
	↓ LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			. . .
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

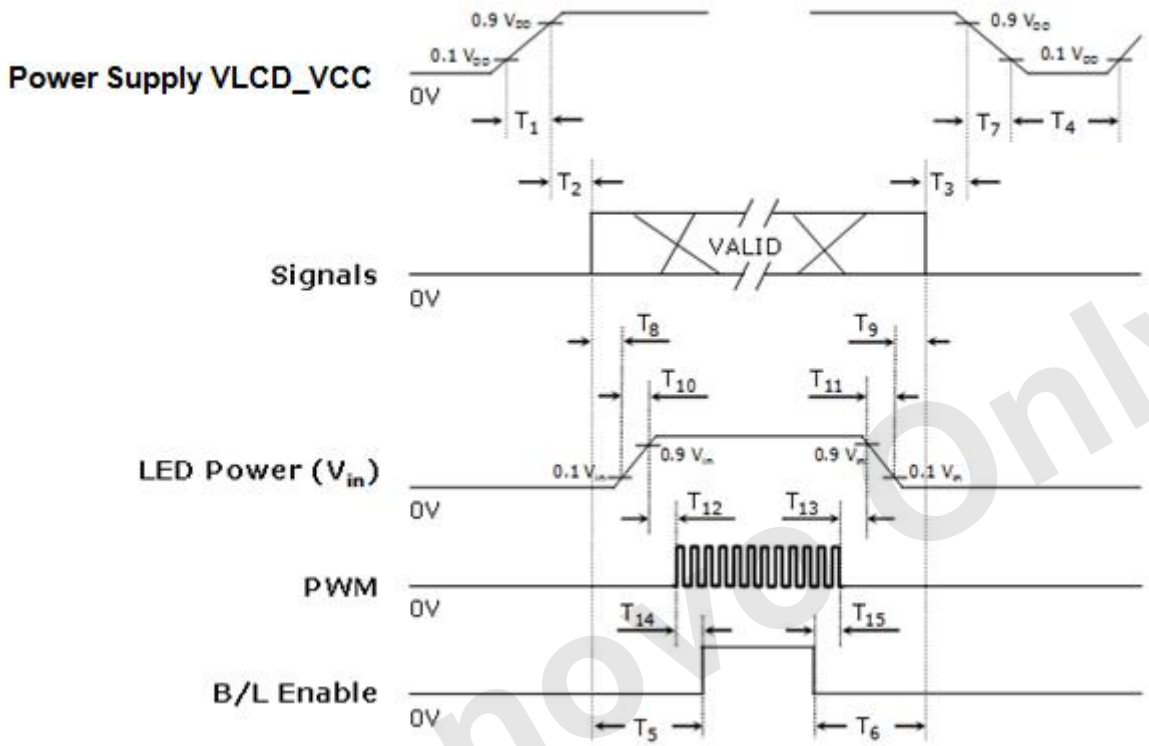
Note (1) Definition of Gray

- Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

5.7 Power ON/OFF Sequence

To prevent the product from being latched up or the DC in the LCD module from starting an operation, the order to turn the power on and off should be changed to the order as shown in the diagram below.



Timing (ms)	Remarks
$0.5 < T_1 \leq 10$	VLCD_VCC rising time from 10% to 90%
$0 < T_2 \leq 50$	Interval from VLCD_VCC to valid data at power ON
$0 < T_3 \leq 50$	Interval from valid data OFF to VLCD_VCC OFF at power Off
$500 \leq T_4$	VLCD_VCC OFF time for Windows restart
$200 \leq T_5$	Interval from valid data to B/L enable at power ON
$200 \leq T_6$	Interval from valid data off to B/L disable at power Off
$0 < T_7 \leq 10$	VLCD_VCC falling time from 90% to 10%
$10 < T_8$	Interval from valid data on to LED driver Vin rising time 10%
$10 < T_9$	Interval from LED driver Vin falling time 10% to valid data Off
$0.5 < T_{10} \leq 10$	LED V_{in} rising time from 10% to 90%
$0.5 < T_{11} \leq 10$	LED V_{in} falling time from 90% to 10%
$0 < T_{12}$	Interval from LED driver Vin rising time 90% to PWM ON
$0 < T_{13}$	Interval from PWM Off to LED driver Vin falling time 90%
$0 \leq T_{14}$	Interval from PWM ON to B/L Enable ON
$0 \leq T_{15}$	Interval from B/L Enable Off to PWM Off

The backlight may be flashed if the interface signal remains floated when the above-mentioned signal becomes invalid.

Note (1) The power voltage from system shall be supplied to the input pin of LCD constantly.

(2) Enable the voltage to the LED within the range, which the LCD is operated. The screen becomes white when turning the back-light on before the LCD is operated or turning the LCD off before turning the back-light off. Operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) Don't leave the system at a high impedance state, which the interface signal is out for a long time after the Vcc is enabled.

(4) The T4 should be measured the module is fully discharged.

(5) The interface signal shall not maintain the high impedance when the power is on.

5.8 Input Terminal Pin Assignment

5.8.1. Input signal & Power Pin Assignment

Connector : 20455-030E-0 (DAICHI SEIKO) or the equipment with the equivalent capability

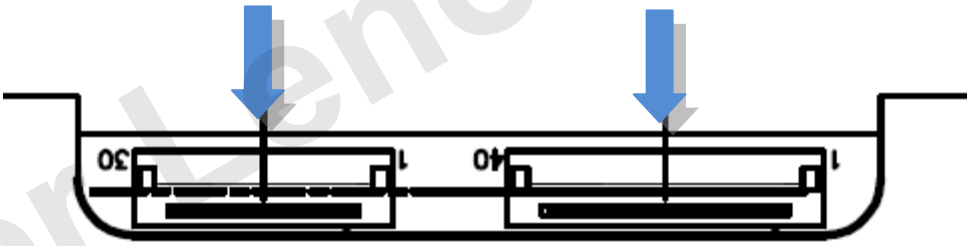
PIN NO	SYMBOL	FUNCTION
1	1_RXO0N	1_Negative Transmission Data of Pixel 0
2	1_RXO0P	1_Positive Transmission Data of Pixel 0
3	1_RXO1N	1_Negative Transmission Data of Pixel 1
4	1_RXO1P	1_Positive Transmission Data of Pixel 1
5	1_RXO2N	1_Negative Transmission Data of Pixel 2
6	1_RXO2P	1_Positive Transmission Data of Pixel 2
7	GND	Power Ground
8	1_RXOC-	1_Negative Sampling Clock
9	1_RXOC+	1_Positive Sampling Clock
10	1_RXO3N	1_Negative Transmission Data of Pixel 3
11	1_RXO3P	1_Positive Transmission Data of Pixel 3
12	GND	Power Ground
13	2_RXO0N	2_Negative Transmission Data of Pixel 0
14	2_RXO0P	2_Positive Transmission Data of Pixel 0
15	2_RXO1N	2_Negative Transmission Data of Pixel 1
16	2_RXO1P	2_Positive Transmission Data of Pixel 1
17	2_RXO2N	2_Negative Transmission Data of Pixel 2
18	2_RXO2P	2_Positive Transmission Data of Pixel 2
19	GND	Power Ground
20	2_RXOC-	2_Negative Sampling Clock
21	2_RXOC+	2_Positive Sampling Clock
22	2_RXO3N	2_Negative Transmission Data of Pixel 3
23	2_RXO3P	2_Positive Transmission Data of Pixel 3
24	GND	Power Ground
25	GND	Power Ground
26	GND (BIST)	L(GND) = Black, H(3.3V) = Built – in – patterns toggle
27	NC	No Connection
28	VDD	Power Supply : +5V
29	VDD	Power Supply : +5V
30	VDD	Power Supply : +5V

Connector : SD-104062-001-S01 (MOLEX) or the equipment with the equivalent capability

PIN NO	SYMBOL	FUNCTION
1	3_RXO0N	3_Negative Transmission Data of Pixel 0
2	3_RXO0P	3_Positive Transmission Data of Pixel 0
3	3_RXO1N	3_Negative Transmission Data of Pixel 1
4	3_RXO1P	3_Positive Transmission Data of Pixel 1
5	3_RXO2N	3_Negative Transmission Data of Pixel 2
6	3_RXO2P	3_Positive Transmission Data of Pixel 2
7	GND	Power Ground
8	3_RXOC-	3_Negative Sampling Clock
9	3_RXOC+	3_Positive Sampling Clock
10	3_RXO3N	3_Negative Transmission Data of Pixel 3
11	3_RXO3P	3_Positive Transmission Data of Pixel 3
12	GND	Power Ground
13	4_RXO0N	4_Negative Transmission Data of Pixel 0
14	4_RXO0P	4_Positive Transmission Data of Pixel 0
15	4_RXO1N	4_Negative Transmission Data of Pixel 1
16	4_RXO1P	4_Positive Transmission Data of Pixel 1
17	4_RXO2N	4_Negative Transmission Data of Pixel 2
18	4_RXO2P	4_Positive Transmission Data of Pixel 2
19	GND	Power Ground
20	4_RXOC-	4_Negative Sampling Clock
21	4_RXOC+	4_Positive Sampling Clock
22	4_RXO3N	4_Negative Transmission Data of Pixel 3
23	4_RXO3P	4_Positive Transmission Data of Pixel 3
24	GND	Power Ground
25	NC(WP)	No connection
26	SCL	DDC Clock
27	SDA	DDC Data
28	GND	Power Ground
29~40	Please refer to the next page	

PIN NO	SYMBOL	FUNCTION
29	PWM	PWM for luminance control
30	BL_EN	BL On/Off
31	VEDID 3.3V	DDC 3.3V Power for EDID
32	GND	Power Ground
33	NC	No connection
34	VBL_12V	LED Power Supply : +12V
35	VBL_12V	LED Power Supply : +12V
36	VBL_12V	LED Power Supply : +12V
37	VBL_12V	LED Power Supply : +12V
38	VBL_12V	LED Power Supply : +12V
39	VBL_12V	LED Power Supply : +12V
40	VBL_12V	LED Power Supply : +12V

Note (1) Pin number starts from the right



Connector Inserting Direction

Fig. Connector diagram

(2) All GND pins should be connected to each other and be connected to the LCD's metal chassis.

(3) All power input pins should be connected to each other.

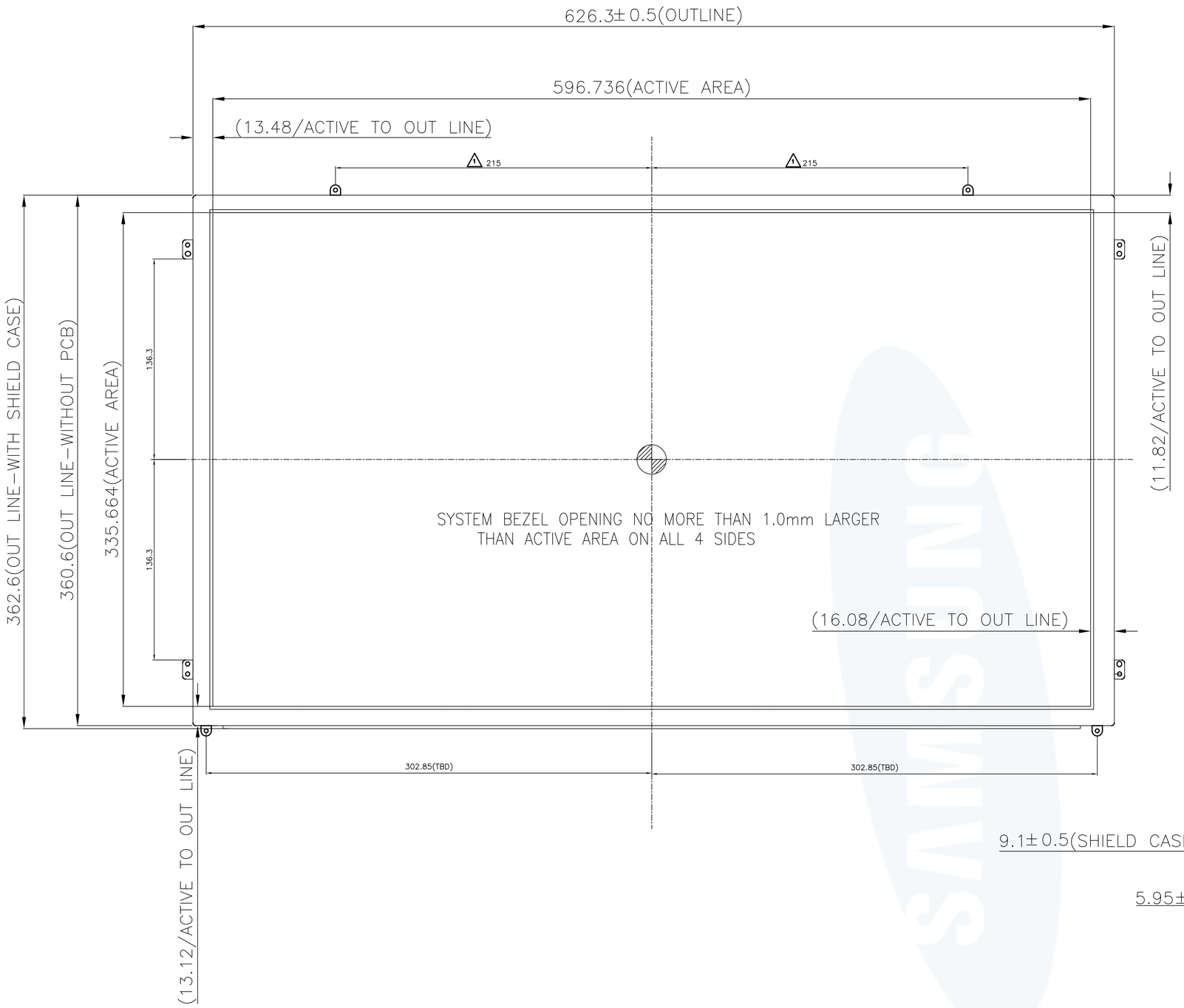
(4) All NC pins should be separated from other signal or power

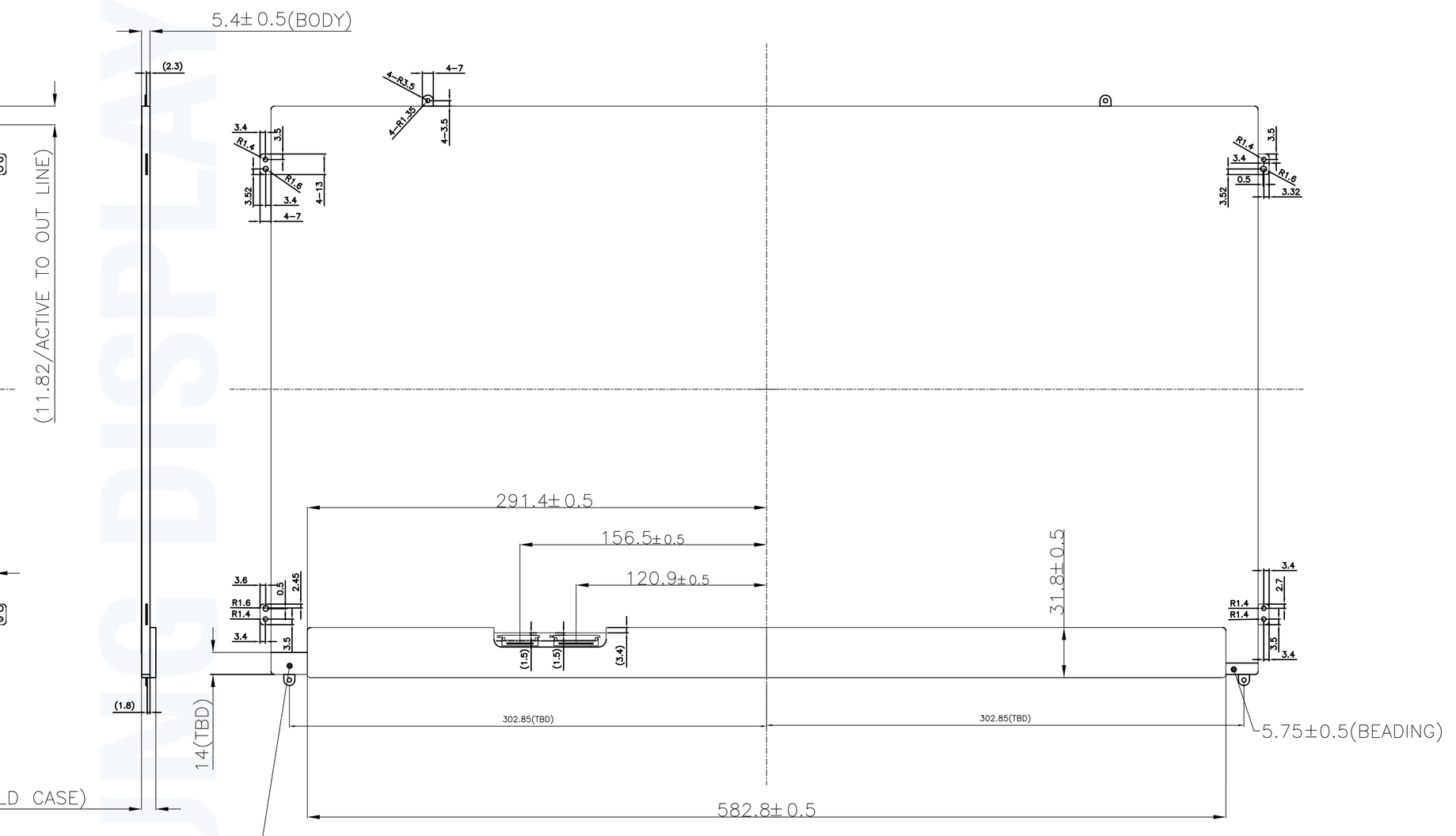
6. Outline Dimension

[Refer to the next page]

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT FINISH	WEIGHT MATERIAL	UNFOLDED DIM OF MATERIAL	REMARK

PRELIMINARY





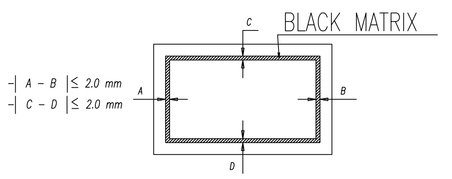
* NOTES

1.BACKLIGHT : 2700HD 3810PKG

2.I/F CONNECTOR SPEC.
- MAKER: TBD
- PART NO.: TBD

3.LED CONNECTOR/WIRE SPECIFICATION.
- MAKER : TBD
- PART NO : TBD

4.BLACK MATRIX SPEC



GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X < 4	±0.05	±0.1	±0.2
4 < X < 16	±0.08	±0.15	±0.3
16 < X < 64	±0.12	±0.25	±0.5
64 < X < 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	REVISION BY	CHK'D BY	APP'D BY
01	13.06.11	Customer Request, LED FPC Design change			

UNIT	mm	DWN BY	SEO'S BY	CHK'D BY	APP'D BY
SCALE	1/	Y.R.KIM			S.KI.LEE
TOLERANCE		13.07.30			12.06.12
					SPEC. NO

SAMSUNG DISPLAY

CHK'D BY	
MODEL NAME	27_QHD_Slim_Bent
PART/SHEET NAME	OUTLINE-DIM.
SHEET	1/1
CODE NO.	
VER.	01

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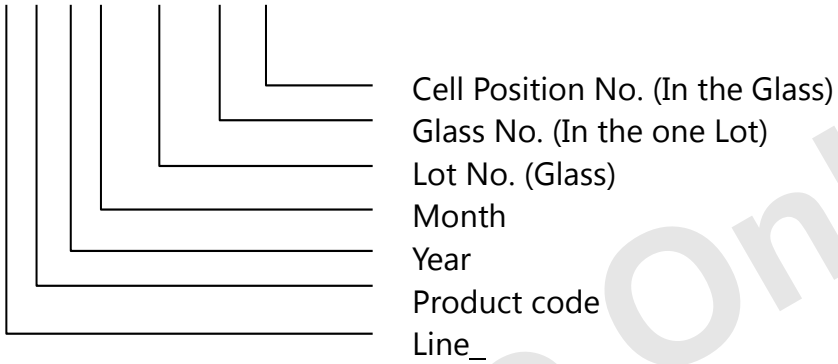
7. Packing

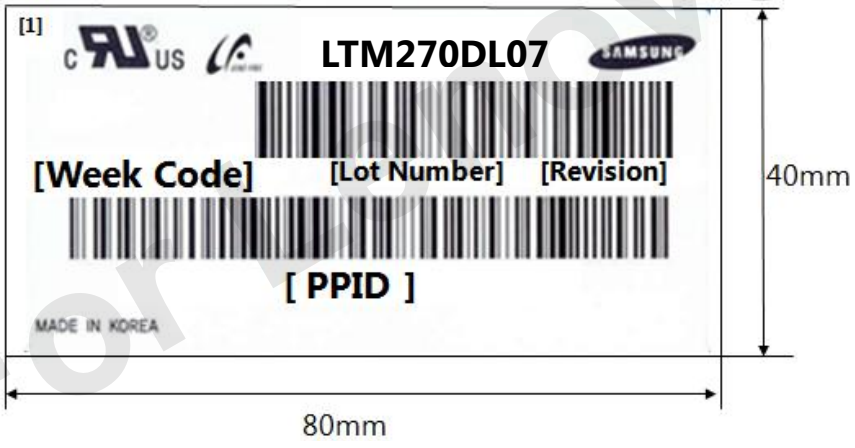
7.1 Marking

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Parts number : LTM270DL07
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X



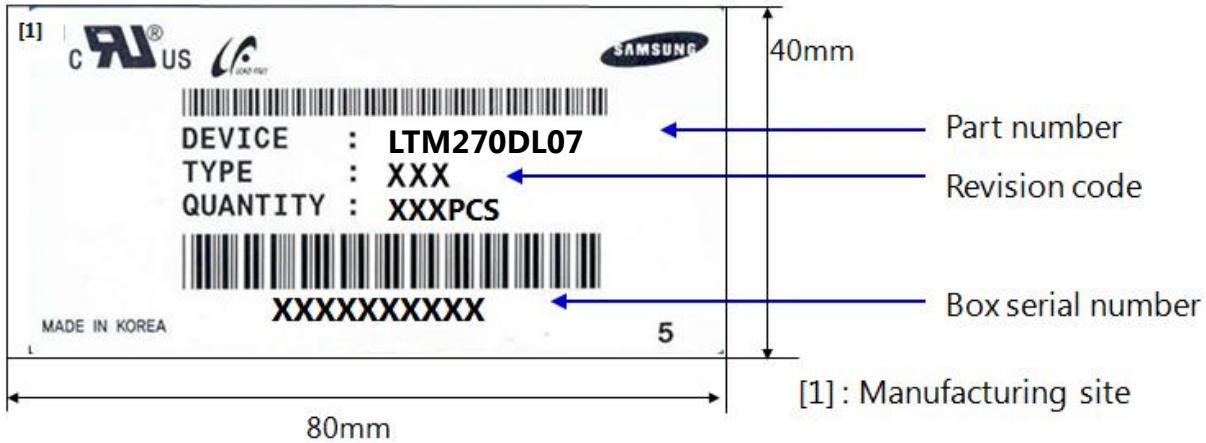
(4) Nameplate Indication



Week code : 11 09
week
year

[1] : Manufacturing site

(5) Packing box attach



8. General Precautions

8.1 Handling Precautions

A. When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

B. Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and LED back-light.

C. Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

D. Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

E. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

F. The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

G. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap

H. Protect the module from static, it may cause damage to the C-MOS Gate Array IC.

I. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

J. Do not disassemble the module.

K. Do not pull or fold the LED FPC.

L. Do not touch any component which is located on the back side.

M. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

N. Pins of I/F connector shall not be touched directly with bare hands.

8.2 Storage Precautions

It is highly recommended to comply with the criteria in the table below

Item	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage life	12 months		
Storage Condition	- The storage room should be equipped with a good ventilation facility, which has a temperature controlling system. - Products should be placed on the pallet, which is away from the wall not on the floor. - Prevent products from being exposed to the direct sunlight, moisture, and water. ; Be cautious not to pile the products up. - Avoid storing products in the environment, which other hazardous material is placed. - If products are delivered or kept in the storage facility more than 3 months, we recommend you to leave products under the condition including a 20℃ temperature and a humidity of 50% for 24 hours. - If you store semi-manufactured products for more than 3 months, bake the products under the condition including the 50℃ temp. and the 10% humidity for 24hrs after being used.		

8.3 Operating Precautions

A. Do not connect, disconnect the module in “Power On” condition.

B. Power supply should always be turned on/off by following 5.7 “ Power on/off sequence”.

C. Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

D. The FPC cable between the LED chips and its converter power supply shall be a minimized length and be connected directly .The longer cable between the back-light and the converter may cause lower luminance of light source (LED).

E. The standard limited warranty is only applicable when the module is used for general Notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

8.4 Others

A. Ultra-violet ray filter is necessary for outdoor operation.

B. Avoid condensation of water. It may result in improper operation or disconnection of electrode.

C. Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, in part contents and environmental temperature, so on) Otherwise the module may be damaged.

D. If the module displays the same pattern continuously for a long period of time, it can be the situation when The image “sticks” to the screen.

E. This module has its circuitry PCB’s on the rear side and should be handled carefully in order not to be stressed.